

## (12) UK Patent Application (19) GB (11) 2 129 603 A

(21) Application No 8327704

(22) Date of filing

17 Oct 1983

(30) Priority data

(31) 57/182954

58/044114

(32) 20 Oct 1982

26 Mar 1983

(33) Japan (JP)

(43) Application published

16 May 1984

(51) INT CL<sup>3</sup> H01B 7/00

(52) Domestic classification

H1A 3A 3E 3M 6L

U1S 1990 2073 H1A

(56) Documents cited

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(58) Field of search

H1A

F1B

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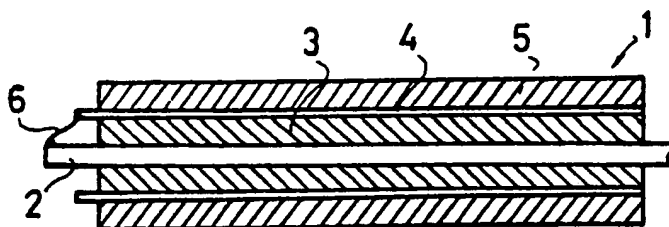
Fields

London WC2A 3LS

## (54) Electric cable

(57) The cable comprises an electrically conductive core 2, a conductive member 4, electrically insulating material 3 and electrically conductive means 6 to short circuit the core 2 with the member 4. The member 4 can be in the form of a cylindrical sheath or a helically wound member, and may be of semiconductor or ferromagnetic material (Figs. 3a to d). The cable is used in the electrical circuits of internal combustion engines, particularly in the ignition circuit.

Fig 1



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Fig 1

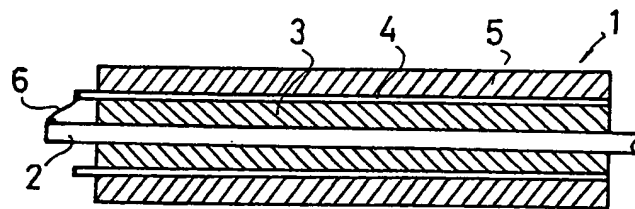


Fig 2

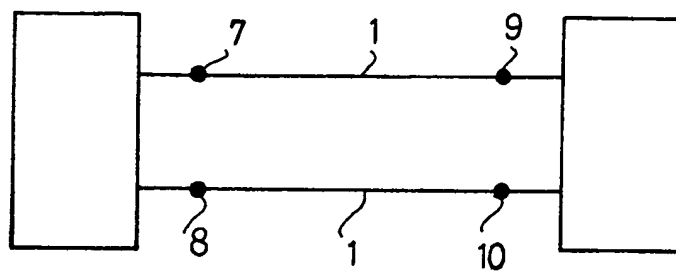
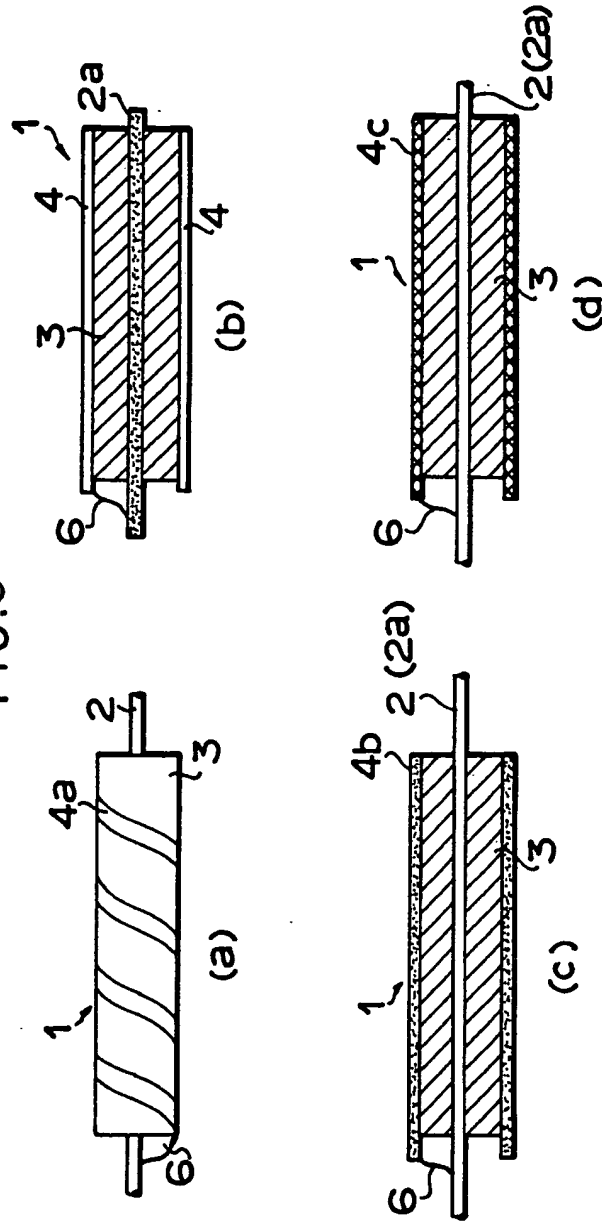


FIG.3



## SPECIFICATION

### Electrical cable

- 5 This invention relates to an electric cable particularly for use with an internal combustion engine run on gasoline, alcohol, propane, hydrogen or the like.

Generally, in such an engine, complete combustion of the fuel at a fixed timing is one of the most important requirements and the engine has a close relation with pulse transmission characteristics of the electric cable.

- 15 Heretofore, the cable used for such engines has not been given the same degree of design attention as mechanical parts. For instance, a cable for high voltage transmission between an ignition coil and a spark plug, capable of withstanding vibration, low in deterioration of the insulation due to the temperature or wetness and low in noise occurrences was desirable. However, the pulse transmission characteristics of the cable was not necessarily good.

- 25 In one aspect the invention provides an electric cable comprising an electrically conductive core, a conductive member around the core with electrically insulating material interposed between the core and the member, and electrically conductive means connecting the core to the member.

- In another aspect the invention provides an electric cable for saving the fuel, comprising a core to carry the electric current, a conductive sheath radially surrounding the core together with insulating therefrom, and a sectional portion which shorts each one end of the core and the conductive sheath to make good the pulse characteristics of high voltage, the cable being for incorporation in an engine circuit to increase the efficiency of the engine.

The invention will now be more particularly described with reference to the accompanying drawings, in which:

- 45 *Figure 1* is a longitudinal sectional view of one embodiment of an electric cable according to the present invention,

*Figure 2* shows how two such electric cables can be used in practice,

- 50 *Figure 3(a)* is a side view of another embodiment of an electric cable according to the present invention, and

- Figures 3(b), (c), (d)* are longitudinal sectional views of other embodiments of electric cables according to the present invention.

- In *Fig. 1*, an electric cable 1 consists of an inner electrically conductive core 2 for carrying the electric current, an electrically insulating sheath 3 which surrounds the core 2, an electrically conductive sheath 4 which surrounds the sheath 3, an outer electrically insulating sheath 5 and a shorting portion 6 which serves to short circuit the core 2 with the conductive sheath 4.

output terminals of a pulse source, and reference numerals 9, 10 represent electrode terminals of a load (e.g. a spark plug) respectively. Each pulse from each output terminal

- 70 7, 8 is transmitted by a pointing vector determined by each electric cable 1 of the two cables 1, 1 and the electric field and the magnetic one determined by the shape, dimension and the electrical characteristics of substances close to the electric cable 1.

- Other embodiments of this invention will now be described with reference to *Figs. 3(a), (b), (c)* and *(d)* as follows.

- Fig. 3(a)* shows an electric cable 1 in which the electrically conductive sheath 4a is wound in a helical or spiral manner with a braiding wire or an electrically conductive tape. Although, as shown, the braiding wire or tape is wound in a single layer only, it may be wound in two or more layers. In this case, the layers of the conductive sheath 4a may be wound in close contact with each other, or with appropriate space therebetween. *Fig. 3(b)* shows a high tension cable for a motor vehicle in

- 90 which the core 2a includes a resistor, either a uniformly distributed resistor, or a combination of a good conductor with a resistor, whereby a good conductor is used for the conductive sheath 4. *Fig. 3(c)* shows a cable in which a conductor or a resistor is used as the core 2 and a semiconductor (ferrite + carbon body or the like) is used as the conductive sheath 4b, whereby the electromagnetic wave is not leaked to the outside due to the conductive sheath 4b of the semiconductor.

- Fig. 3(d)* shows a cable in which a conductor or a resistor is used as the core 2 as in the embodiment of *Fig. 3(b)* and a ferro-magnetic body (permalloy, nickel alloy, etc.) is used for the conductive sheath 4c, whereby the field strength of the electric cable 1 decreases due to the conductive sheath 4c possessing ferro-magnetism. Furthermore, the conductive sheath 4 may be a punched metal shape, a conductive paint or the like other than a cylindrical conductive sheath.

- Furthermore, since each electric cable 1 has a conductive sheath 4 at approximately the same electric potential as the core 2, the electric field influences upon the magnetic field caused by the current flow of the core is different from the case in which a conventional electric cable is used, thereby providing a preferred electromagnetic field to ensure the transmission of the power. In this case, the conductive sheath 4 is not used for the purpose of transmitting the electric current directly.

- In addition, heretofore, a body (including a chassis, engine and the like) circuit has served as a return for the current notwithstanding the important portion of the closed circuit. This is, however, only a substitute for convenience and impedes the characteristics of the electric

Therefore, if an electric cable according to this invention is used for the return of the current, a complete closed circuit is made up and its characteristics are not impeded.

- 5 As described above, the electric cable according to this invention is applied to the entire closed circuit including a battery, an ignition coil, a distributor and its sensor, and each spark plug to carry out the running test.
- 10 As a result, engine starting becomes smooth, and the travelling acceleration follows in the pedal reserve of an accelerator in any velocity, and the pedal reserve of the accelerator for obtaining the same acceleration can do with a little one. In addition, the sound of the engine becomes very calm, and the content of CO and HC in exhaust gas decreases.

- Cables embodying the invention are simple in construction and cheap to make. They give
- 20 increased engine efficiency coupled with a decrease in environmental pollution.

#### CLAIMS

1. An electric cable comprising an electrically conductive core, a conductive member around this core with electrically insulating material interposed between the core and the member, and electrically conductive means connecting the core to the member.
- 30 2. The cable of claim 1, wherein the electrically conductive member defines at least one helix about the core.
3. The cable of claim 1, wherein the member is of semi-conductor material.
- 35 4. The cable of claim 1, wherein the member is of ferro-magnetic material.
5. An electric cable comprising a core to run the electric current therethrough, a conductive sheath radially surrounds said core together with insulating therefrom, and a shortening portion, and being used by shortening with a section which necessitates to run the electric current.
- 40 6. An electric cable according to claim 5, wherein said conductive sheath is wound like a spiral with a braiding wire or a conductive tape.
7. An electric cable according to claim 6, wherein said conductive sheath is a semiconductor.
- 50 8. An electric cable according to claim 7 wherein said conductive sheath is a ferro-magnetic body.
9. An electric cable substantially as hereinbefore described with reference to any one of the accompanying drawings.
- 55 10. Any novel feature or combination of novel features hereinbefore described with or without reference to the accompanying drawings.
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